

Remarks

Claims 3 and 7 have been rewritten in amended form. Claims 59-60 have been cancelled. The allowance of claims 61 is noted with appreciation. Claims 1, 4, 5, 29-30, 33-34, 37-38, 41-44, 47-52 and 64 are resubmitted without amendment. Such cancellations of and amendments to claims are only for the purpose of expediting the prosecution of this application and are not to be construed as an abandonment of any of the novel concepts disclosed therein.

The comments of the applicant below are each preceded by related comments of the examiner:

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 29, 30, 33, 34, 37, 38, 41, 42, 49, and 52 are rejected under 35

U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 29, 30, 33, 34, 37, 38, 41, 42, 49, and 52 recite method steps directed to a method of using the apparatus claim on which they depend. Note the relevant teaching from the MPEP regarding Ex parte Lyell cited below.

A single claim which claims both an apparatus and the method steps of using the apparatus is indefinite under 35 U.S.C. 112, second paragraph. In *Ex parte Lyell*, 17 USPQ2d 1548 (Bd. Pat. App. & Inter. 1990), a claim directed to an automatic transmission workstand and the method steps of using it was held to be ambiguous and properly rejected under 35 U.S.C. 112, second paragraph. Such claims should also be rejected under 35 U.S.C. 101 based on the theory that the claim is directed to neither a "process" nor a "machine," but rather embraces or overlaps two different statutory classes of invention set forth in 35 U.S.C. 101 which is drafted so as to set forth the statutory classes of invention in the alternative only. *Id.* at 1551.

The applicant respectfully disagrees. Following paragraph is from MPEP 2173.05(f):

A claim which makes reference to a preceding claim to define a limitation is an acceptable claim construction which should not necessarily be rejected as improper or confusing under 35 U.S.C. 112, second paragraph. For example, claims which read: "The product produced by the method of claim 1." or "A method of producing ethanol comprising contacting amylose with the culture of claim 1 under the

following conditions are not indefinite under 35 U.S.C. 112, second paragraph, merely because of the reference to another claim. See also Ex parte Porter, 25 USPQ2d 1144 (Bd. Pat. App. & Inter. 1992) where reference to "the nozzle of claim 7" in a method claim was held to comply with 35 U.S.C. 112, second paragraph. However, where the format of making reference to limitations recited in another claim results in confusion, then a rejection would be proper under 35 U.S.C. 112, second paragraph.

Claims 29, 30, 33, 34, 37, 38, 42, 49 and 52 claim methods specifically applicable to the iron trap defined in claims 3 and 7. Claims 29, 30, 33, 34, 37, 38, 42, 49 and 52 make reference to claims 3 and 7 to define the specific ion trap limitations. It is clear that claims 29, 30, 33, 34, 37, 38, 42, 49 and 52 are directed to methods not product and the claims they are depending on merely define limitations for these method claims, thus should not being objectionable under 35 U.S.C. 112, second paragraph.

However, if the format of making reference to limitations recited in claim 3 and/or 7 results in confusion, the applicant will make appropriate amendment without narrowing to put claims 29, 30, 33, 34, 37, 38, 42, 49 and 52 in allowable form.

Furthermore, based on new USPTO product and process claims examination guidelines in light of *In re Ochiai*, 71 F.3d 1565, 37 USPQ2d 1127 (Fed. Cir. 1995) and *In re Brouwer*, 77 F.3d 422, 37 USPQ2d 1663 (Fed. Cir. 1996), when the product is found allowable, any process claim which contains limitations corresponding to the allowed/allowable product should not be rejected. Since claims 3 and 7 are amended and are in allowable form, claims 29, 30, 33, 34, 37, 38, 42, 49 and 52 are also in allowable form.

Claim 41 dependent on claim 3 is an apparatus claim with functional limitation, which should not be subject to the same rejection as claims 29, 30, 33, 34, 37, 38, 42, 49 and 52. Since claim 3 is rewritten in allowable form, claim 41 should also be allowable.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 29, 30, 33, 34, 37, 38, 41, 42, 49, and 52 are rejected under 35

U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

As pointed out above, claims 29, 30, 33, 34, 37, 38, 41, 42, 49, and 52 recite both an apparatus and the method steps for using said apparatus and therefore overlap two statutory classes of invention.

Since Claims 29, 30, 33, 34, 37, 38, 42, 49 and 52 make reference to preceding claims 3 and 7 which define limitations for these method claims, accordingly, withdrawal of this ground of rejection is respectfully requested.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1, 4, 5, and 64 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Franzen et al. (USPN 5,468,958).

Regarding claim 1, Franzen et al. teaches an ion trap comprising a three-dimensional rotationally symmetric ring electrode (Items 3, 4, and 5) and two cap electrodes (Items 1 and 2 and Items 6 and 7) where the cap electrodes comprise a cone electrode (Item 2 for example), and a disk electrode (Item 1 for example) where the ring electrodes and cap electrodes generate dipolar, quadrupole, and octopole fields (Col. 3 Lines 59-68). Since the electrodes create the required fields recited in the claim, Franzen et al. satisfies the material requirements of Claim 1.

Regarding claim 4, the cap electrodes are divided into two main parts, denoted by Items 1 and 2. These parts have surfaces corresponding to the conic and spherical surface sections recited in claim 4. For example, the field emitting means of electrode 2 comprises a portion of a spherical surface at a plurality of locations, note the region immediately surrounding the aperture in Item 2 in Fig. 1 at the central axis of the trap and the taper associated with said Item. Secondly, the cap electrodes further comprise a portion having the shape of a conic surface, most notably in Fig. 1 Item 1, where a portion of the electrode sloping towards the aperture, but prior to a "step" on the electrode, has the shape of a conic section. Claim 4 further recites that the "cross sectional surface of the ring electrode consists of a portion of a circle and two straight

lines jointed in orthogonal to the circle, the surfaces of the two cap electrodes facing toward the inside of said ion trap.” This structure recites a rotationally hyperbolic electrode structure and conforms to the electrode structure featured in Fig. 1 of Franzen et al. Note further Col. 4 Lines 43-55.

Regarding claim 5, Franzen et al. teaches that the cap electrodes are divided into rotationally symmetrical sets of component electrodes (Col. 4 Lines 1-24).

Regarding claim 64, Franzen et al. further teaches an operating means (10) for ion mass analysis.

These grounds of rejection are respectfully traversed. “It is well settled that anticipation under U.S.C. 102 requires the presence in a single reference of ALL of the elements of a claimed invention arranged in the claim.” *Ex parte Cho[pra]*, 229 U.S.P.Q. 230 231 (BPA&I 1985), *Connell v. Sears, Roebuck & Co.*, 220 U.S.P.Q. 193, 198 (Fed. Cir. 1983).

Claim 1 call for “a third means for generating an independent, electrically variable, electrostatic multipole field”. The important multipole field characteristic – “electrostatic”, acknowledged by examiner as patentable, is neither taught nor suggested in prior art including cited Franzen reference (US 5468958). Specifically:

In Franzen reference (US 5468958), Franzen and Wang described a quadrupole ion trap with switchable multipole fractions in US. Pat. 5,468958, but the multipoles are RF based. The multipole is generated by “applying a second RF voltages”, thus the multipoles in Franzen reference are RF multipoles, while claim 1 in present application calls for that the third means generated multipoles are electrostatic, and more specifically DC generated multipoles as further claimed in claim 3. Due to different multipoles field characteristics in ion traps between Franzen reference and present application, ion movements in Franzen reference based ion trap and present application based ion trap will be different and be dominated by different theoretical equations as further described and explained in the specification of present application.

The advantages of claim1 which calls for “independent, electrically variable, electrostatic multipole” are:

- As claimed in scanning method claims (29, 30, 33, 34, 37, 38, 42, 49 and 52), electrostatic multipoles make operating (scanning methods) claimed ion trap substantially different from prior art.
- As being explained in the “Background of the Invention” of present application for the prior art scanning methods which include so called “mass-selective storage” in U.S. Pat. 3,527,939, “mass-selective instability” in U.S. Pat 4,548,884 and the “mass-selective resonance ejection” in U.S. Pat. Re 34,000. Those prior art scanning methods analyze the ion-mass with “linear resonance” based on linear Mathieu equation:

$$d^2u/d\xi^2 + (a_u - 2 * q_u * \cos(2*\xi)) * u = 0 \quad (2)$$

Referring to Fig. 2 of the present application, the linear resonance is shown in peak profile labeled by “A”. The conventional Paul’s trap structure based on two caps and one ring in prior art is generally operated in a high or medium high vacuum conditions, those mass scanning methods with linear resonance will cause the mass resolving power to decrease dramatically. If the ion traps are operated in a lower vacuum, the linear resonance frequency curve will be broadened due to massive collision between ion and neutral gas, which will cause the mass resolving power to decrease dramatically.

In contrast, the present application uses the non-linear ion trap and non-linear resonance to analyze the ion-masses which are still substantially different from the prior art non-linear resonance mass scanning methods as described in Franzen in US. Pat. 4,975,577; US. Pat. 5,028,77 and U.S. Pat. 5,170,054, which are generated by the superposition of RF multipoles.

In aforementioned patents, only special non-linear resonance lines in the stability diagram (for example, $\beta_z = 2/3$), caused by the superposition of RF multipoles, are applied in a mass scanning method to analyze mass ions. The detailed theoretical analysis of non-linear resonance caused by RF multipoles has been performed in article “The non-linear resonance ion trap, Part 2, A general theoretical analysis” (Int. J. Mass Spectrom. and Ion Proc. 124, (1993), 125-144). The calculation proves that RF multipoles generate a large amount of very complicated non-linear resonances confirmed by experimental

results (referring to article by Alheit et al “Higher order non-linear resonances in a Paul trap” (Int. J. Mass Spectrum. and Ion Proc. 154, (1996), 155-169)). Those resonances make mass analysis very difficult because unexpected mass peaks may occur. As known in the art, those unexpected mass peaks are called “ghost peaks”.

In contrast, using electrostatic multipoles as in present application will keep mass scanning with non-linear resonance while avoid those large amounts of complicate non-linear resonances. The unexpected “ghost peak” is eliminated. As described in present application:

The ion motion in these fields is governed by the following equation:

$$d^2z / d\tau^2 + \gamma_z dz / d\tau + \omega_z z + \alpha z^3 = F \cos(\xi \tau).$$

The mass scanning method is described in detail in the specification and shown in Fig. 2 with resonance curve B and C. The scanning method is especially applied to high vacuum condition to keep or increase mass resolution power. The mass scanning direction has depicted by arrows in Fig. 2 clearly. The method is described in the specification in a few paragraphs.

Therefore, using electrostatic, and more specifically DC, multipoles in the mass scanning method is unique and substantially different from prior art.

New claim 68 is added which, the applicant believes, is fully supported by the specification and is patentable over the prior art.

Claims 59-60 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by
Baba et al. (USPN 6,075,244).

Baba et al. teaches a three dimensional ion trap where the trap is a Paul Trap
and the trap is in a chamber maintained at a pressure in the range between 10^{-2} to
 10^{-1} millibar. Note Col. 2 Lines 39-62 of Baba et al.

Claims 59-60 have been cancelled.

Allowable Subject Matter

Claims 3, 7, 43-44, 47-48, and 50-51 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 3 and 7, the prior art fails to teach or suggest the application of a DC potential to a set of the component electrodes in the cap electrodes of a three dimensional ion trap. By contrast, the prior art most relevant to an ion trap having cap electrodes divided into multiple component electrodes, Franzen et al., utilizes only an RF signal to create dipole, quadrupole, and octupole fields in a three dimensional ion trap. Claims 43-44, 47-48, and 50-51 are similarly indicated as having allowable subject matter by virtue of their dependency.

Claim 61 is allowed.

The following is an examiner's statement of reasons for allowance:

Claim 61 is allowable for the reasons set forth regarding claims 3 and 7 above.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Claims 3, 7, 43-44, 47-48, 50-51 were objected to as being dependent upon a rejected base claim but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. We have rewritten dependent claims 3 and 7 in independent form. Accordingly, these claims are submitted to be properly allowable in this application.

The applicant acknowledges the examiner's indication that the claim 61 is allowed.

Comments on statement of reasons for allowance

The applicant does not concede that there are not other good reasons for patentability of the claims discussed by the examiner, or of the other allowed claims, or of other claims.

All of the dependent claims are patentable for at least the reasons for which the claims on which they depend are patentable.

Canceled claims, if any, have been canceled without prejudice or disclaimer.

Any circumstance in which the applicant has (a) addressed certain comments of the examiner does not mean that the applicant concedes other comments of the examiner, (b) made arguments for the patentability of some claims does not mean that there are not other good reasons for patentability of those claims and other claims, or (c) amended a claim does not mean that the applicant concedes any of the examiner's positions with respect to that claim or other claims.

No fee is believed to be due.

Date 05-11-2005

7 Black Bear Lane
Westford, MA 01886

Respectfully submitted,

Yang Wang
Yang Wang